

INFERRED VARIABLE FEO CONTENT IN MEDIUM-SIZED LUNAR PYROCLASTIC DEPOSITS FROM LRO DIVINER DATA. K.A. Bennett¹, B. Horgan², B. Greenhagen³, C. Allen⁴, and J.F. Bell III¹; ¹School of Earth and Space Exploration, Arizona State University, ²Earth Atmospheric and Planetary Sciences, Purdue University, ³Jet Propulsion Laboratory, ⁴NASA Johnson Space Center

Lunar pyroclastic deposits (LPDs) are low albedo features that mantle underlying terrain (Gaddis *et al.* 1985). They are high priority targets for science and exploration as they are believed to originate from and therefore reflect the composition of the deep lunar interior (NRC, 2011). They are also the best potential resource of oxygen out of any Apollo samples (Allen *et al.* 1996).

Historically, LPDs have been divided into regional versus local categories (Gaddis *et al.* 2003). The large (>1000 km² area) regional deposits are deeply sourced (>400 km deep) and result from fire fountaining. Small (<1000 km²) local deposits are thought to result from Vulcanian eruptions in which magma is slowly emplaced beneath the surface until enough volatiles exsolve and the high pressure causes an explosion. Bennett *et al.* (2013) identified a local deposit (674 km² area) that may have resulted from both Vulcanian activity and fire fountaining. This deposit potentially represents a new intermediate class of LPDs that straddles the interface between the two formation mechanisms. The deposit also exhibits the highest inferred FeO wt.% of any known lunar glass. In this work we investigate the inferred FeO abundances of other medium-sized deposits to characterize this potential new class of deposits and understand the magnitude of variations in inferred FeO among pyroclastic deposits.

We use the method of Greenhagen *et al.* (2010) to calculate the wavelength of the Christiansen Feature (CF) from Lunar Reconnaissance Orbiter Diviner Lunar Radiometer instrument thermal-infrared observations for four medium-sized deposits. From the CF values, we estimate each deposit's FeO abundance using the method of Allen *et al.* (2012).

The four LPDs that we examined (Oppenheimer South, Beer, Cleomedes, and J. Herschel) all have average CF values from 8.22-8.28 microns, corresponding to FeO abundances of ~10-15 wt.%. All of these values are within the range and uncertainties of FeO abundances measured in Apollo samples. As previously identified, the Oppenheimer South deposit exhibits an area of enhanced CF values (8.49 microns) that, if the methods of Allen *et al.* (2012) can be extrapolated, correspond to a highest observed ~30 wt.% FeO. Moon Mineralogy Mapper near-infrared spectra indicate that this area is glass-rich as opposed to olivine-rich.

While we are still investigating the nature of the high CF wavelength in Oppenheimer South, spatially-resolved observations there and (to a smaller degree) in our other study sites, shows that FeO wt.% can vary within LPDs. Thus, obtaining only the average FeO abundance over a large area may not be adequate to understand global variation. The magnitude of Oppenheimer South's CF variability, if due to actual surface variations rather than calibration artifacts or spectral mixing, could indicate that it is a unique deposit and not part of a new mid-sized class of deposits. The higher value could be a result of its location within the South Pole Aitken Basin and exsolution of more deeply sourced magma due to the thin crust there.